CRC for
Water Sensitive Cities

The Case for Benefit Estimation of WSUD

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The benefit of assessing benefits – why should we?








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Content

- Why seek multiple-values?
- Why assess?

Urban wetland in Taiwan

Detention pond retrofitted as a park, Japan

Sustainability ?

- .. Endurance of systems and processes.
- "Carrying capacity"

- Responding to 'creeping' disasters

Resilience

- Climate change
- Disaster risk

In the present discourse of urban development, sustainability concept alone does not respond adequately to some important needs.

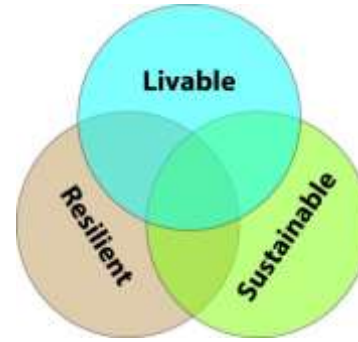
- Responding to 'Rare' events

Sustainable, Resilient … and?

- Both long-term goals
- Homo-sapiens a short-term focused animal and usually not good at reckoning:
  - –Creeping phenomena with long-term impact
  - –Very low probability (but high consequence) events.

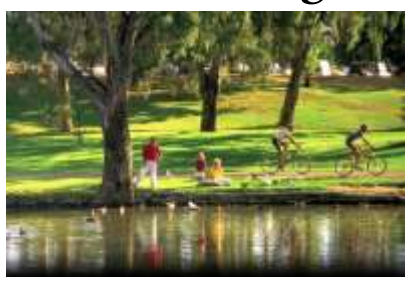
Water Sensitive Cities
Three capacities

- Carrying Capacity : Sustainability
- Coping Capacity : Resilience
- Comfort Capacity : **Livability**



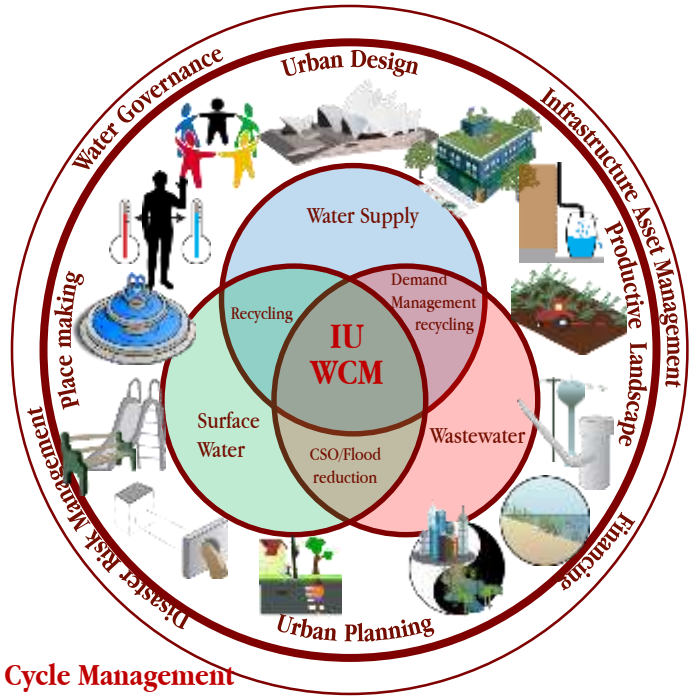
Integrate Livability

- Sustainability, Resilience are essential, but
- Don't forget immediate benefits – Livability.



People respond more readily to livability.

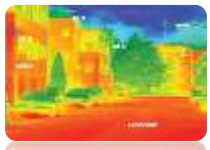
Water Sensitive Cities



IUWCM: Integrated Urban Water Cycle Management

The need to make an economic argument

- Inclusion of green infrastructure in urban areas is usually for aesthetic, recreational or biodiversity reasons **not to do with water**
- More apparent drivers, benefits & costs for improved water management by WSUD will **strengthen the argument**
- Policy makers will then **listen**



Should we value benefits?

- Difficult to
  - Identify & link benefits to quantifiable outcomes
  - Value quantified benefits (reliance on transfers)
  - Aggregate (benefits, populations, time)
- Uncertainty
- Takes time and resources
- Moral concerns

If we don't, they are zero

What is possible? How do we account for the benefits and should we?

Examples of multiple value from SuDS

(main objective: Storm-water management)






Evaluating the benefits unlocks the potential for…

- Fairer comparisons
- Better decision making
- Meeting funding requirements
- Enabling conversations
- Delivering WSUD

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Case study

Upper Quitacalzones catchment
Montevideo, Uruguay

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Case study

Upper Quitacalzones catchment

Case study

Montevideo, Uruguay, South America

Problem:

- 220 ha of urban residential area
- Combined Sewer System starts to overflow for storms of Tr = 3 years
- Around 610 houses are affected
- Approximate Cost of flooding = 18.000.000 US$ (30.000 US$ per house approx)

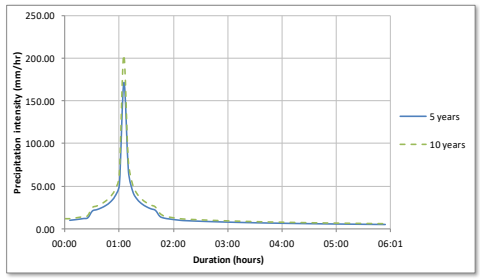
Current Proposed Solution:

- 3 Underground storages
- Avoids flooding for storms up to Tr =10 years
- Approximate Implementation cost = 10.000.000 US$

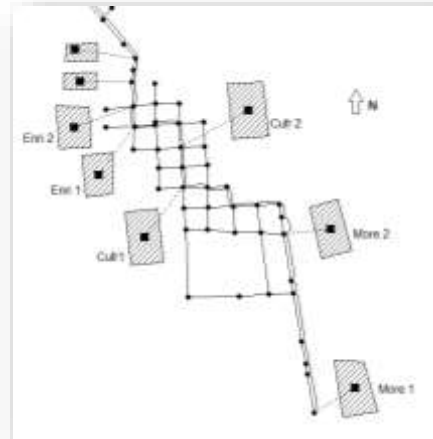
Model set up – SWMM 5.0 (US EPA)

Design rainfalls

- Synthetic rainfall
- Tr of 5, 10, 20 and 50 years



SWMM Network & subcatchments



SuDS - costs & ES benefits

Analyzed Solution:

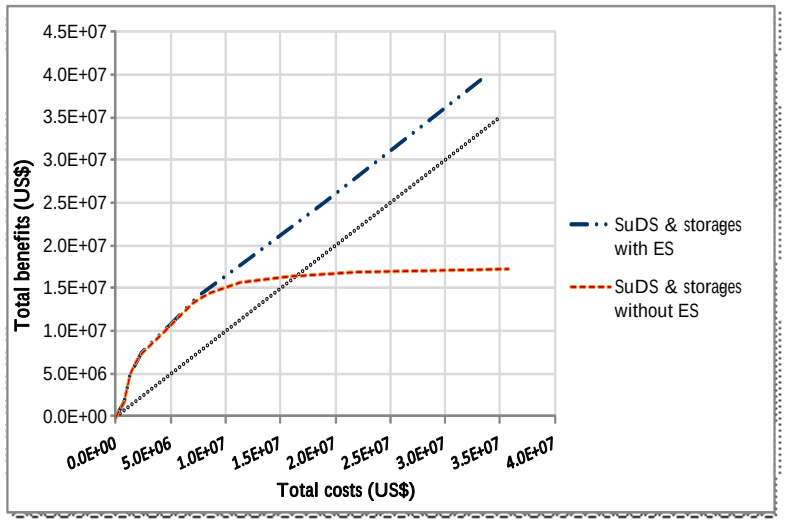
- Green roofs & Rain Barrels
- Approx 64% of the area is covered by roofs. 80% of that is suitable for green roofs

		 ❑ 600 litres ❑ "treats" 40 m² of roof	 ❑ Extensive green roof ❑ Soil depth = 90 mm
Costs	❑ Present values ❑ 30 years lifespan ❑ Installation & maintenance	**300 US$/barrel** (7.5 US$/m²)	**142 US$/m²**
ES benefits	❑ Present values ❑ 30 years lifespan ❑ SWM benefits not considered here	main water saving, energy & carbon emissions saving (less water treated); **125 US$/barrel** (3.1 US$/m²)	energy & carbon emissions saving (building isolation & less water treated), property value uplift, food production, increase of roof longevity, air pollution removal, aesthetics. **132 US$/m²**

Multi-objective optimization Scenarios

	With ES	Without ES
SuDS	Scenario 1	Scenario 2
SuDS & storages	Scenario 3	Scenario 4

'Value' depends on how you look at it!



What others have done already to assess multiple benefits

- Number of examples from around the world

- **Ecosystem Services**:
  - Mayesbrook Park
  - Flood & Coastal Erosion Risk Management – Eftec 2010
- **Green Infrastructure**:
  - Green Infrastructure North West – Halewood primary school SuDS
- **Surface Water**:
  - Centre for Neighborhood Technology: Philadelphia CSO reduction SuDS
- **Environmental**
  - INFFER - Investment Framework for Environmental Resources
- **Planning**
  - Integrated Valuation of Environmental Sciences and Tradeoffs (InVEST)
- Many **health** economic benefit assessments

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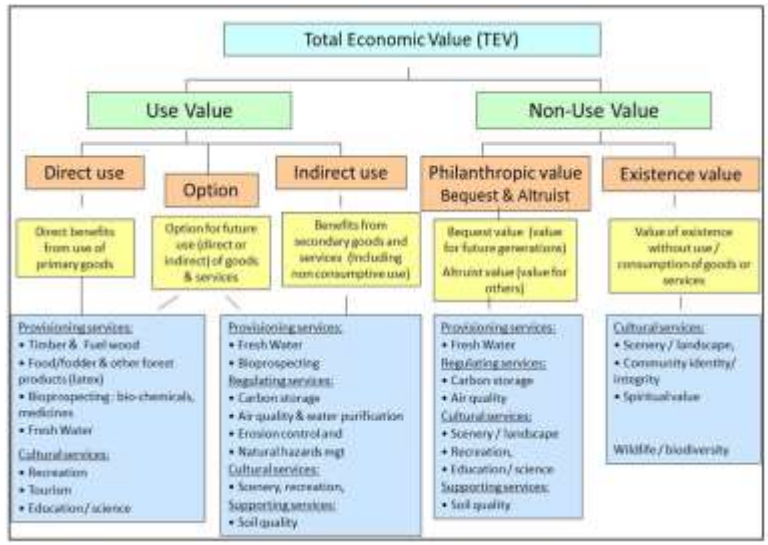

(Marlow et al, in print, WERF)

Conclusion: Calculate (& Talk) money!

- Never underestimate the business case.
- Think of multiple benefits.
- Focus on Livability too.
- Calculate cost/benefit.